

Appl. No. 10/065,908
 Amdt. dated August 22, 2005
 Reply to Office action of 07/13/ 2005

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

- 5 Claim 1 (Currently Amended): A method for motion estimation in video compression, the method comprising:

selecting a plurality of search locations within a single resolutioned search window, the search locations selected according to a predetermined table comprising a first column, a second column, and a plurality of
 10 rows, each row in the table specifying a unique search location;

generating a match-value for each search location indicating how closely each search location matches a reference block;

generating a plurality of level-values based on first dispositional relationships of the search locations and the relative magnitudes of the match-values;
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generating a preliminary motion vector based on the level-values;

generating a plurality of candidate results based on second dispositional relationships of the search locations and the relative magnitudes of the match-values; and

- 20 generating a final motion vector by altering the preliminary motion vector according to the candidate results as indicated by a predetermined set of formulas;

wherein the table is an orthogonal table generated using the statistical model

- 25 $x = \mu + A + B + C + D + A \times B + A \times C + B \times C + \epsilon$ where ϵ is an error factor, and μ is an average of A , B , C , D , AB , AC , and BC , the orthogonal table having columns A , B , C , and D .

Claims 2-3 (Cancelled)

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Claim 4 (Currently Amended): The method of claim [[3]] 1 wherein the column A equals the most significant bit of an X coordinate in the search window, the column B equals the second most significant bit of the X coordinate in the search
5 window, the column C equals the most significant bit of a Y coordinate in the search window, the column D equals the second most significant bit of the Y coordinate in the search window.

Claim 5 (Currently Amended): The method of claim [[2]] 1 wherein generating the
10 candidate results comprises separately summing the match-values of the search locations having a third value in the first column and the third value in the second column, having the third value in the first column and a fourth value in the second column, having the fourth value in the first column and the third value in the second column, and having the fourth value in the first column and the fourth
15 value in the second column, and selecting the smallest sum as the candidate result.

Claim 6 (Currently Amended): The method of claim [[2]] 1 wherein the level-values comprise, for each column in the predetermined table, a first level-value being a sum of the match-values of the search locations having a first value in that column,
20 a second level-value being a sum of the match-values of the search locations having a second value in that column, and a third level-value being the absolute difference between the first level-value and the second level-value.

25 Claim 7 (Original): The method of claim 6 wherein the preliminary motion vector comprises a plurality of bits representing an X coordinate within the search window and a plurality of bits representing a Y coordinate within the search window, the most significant bit of the X coordinate of the preliminary motion vector is the first value if the first level-value of the first column is less than the
30 second level-value of the first column and the most significant bit of the X

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coordinate of the preliminary motion vector is the second value if the first level-value of the first column is not less than the second level-value of the first column, the Y coordinate of the preliminary motion vector is the first value if the first level-value of the second column is less than the second level-value of the second column and the most significant bit of the Y coordinate of the preliminary motion vector is the second value if the first level-value of the second column is not less than the second level-value of the second column.

10 Claim 8 (Original): The method of claim 6 wherein the final motion vector comprises a plurality of bits representing an X coordinate within the search window and a plurality of bits representing a Y coordinate within the search window, the candidate results being used to generate the most significant bit of the X coordinate of the final motion vector when indicated by the predetermined set of
15 formulas and the candidate results being used to generate the most significant bit of the Y coordinate of the final motion vector when indicated by the predetermined set of formulas.

20 Claim 9 (Original): The method of claim 1 wherein generating the match-values comprises calculating the sum of the absolute differences in brightness between each pixel in the reference block and a corresponding pixel in the search location to generate the match-value for that search location.

25 Claim 10 (Currently Amended): A device for motion estimation in video compression, the device comprising:

a control circuit for executing computer code; and
a memory comprising:
30 computer code that determines a plurality of search locations within a

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single resolutioned search window;
a predetermined orthogonal table having a first column, a second column,
and a plurality of rows, each row in the table specifying a unique
search location;
5 computer code that compares a reference block with each search location
and generates a match-value for each search location indicating how
closely each search location matches the reference block;
computer code that generates a plurality of level-values based on a first
dispositional relationship of the search locations and the relative
10 magnitudes of the match-values;
computer code that generates a preliminary motion vector based on the
level-values;
computer code that generates candidate results based on a second
dispositional relationship of the search locations and the relative
15 magnitudes of the match-values; and
computer code that generates a final motion vector by altering the
preliminary motion vector according to the candidate results as
indicated by a predetermined set of formulas;
wherein the level-values comprise, for each column in the predetermined
20 table, a first level-value being a sum of the match-values of the
search locations having a first value in that column, a second
level-value being a sum of the match-values of the search locations
having a second value in that column, and a third level-value being
the absolute difference between the first level-value and the second
25 level-value.

Claim 11 (Cancelled):

Claim 12 (Currently Amended): The device of claim [[11]] 10 wherein the orthogonal
30 table is conformal with the statistical model $x = \mu + A + B + C + D + A \times B + A \times$

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$C + B \times C + \varepsilon$ where ε is an error factor, and μ is an average of A , B , C , D , AB , AC , and BC .

Claim 13 (Cancelled):

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Claim 14 (Currently Amended): The device of claim ~~[[13]]~~ 10 wherein the preliminary motion vector comprises a plurality of bits representing an X coordinate within the search window and a plurality of bits representing a Y coordinate within the search window, the most significant bit of the X coordinate of the preliminary motion vector is the first value if the first level-value of the first column is less than the second level-value of the first column and the most significant bit of the X coordinate of the preliminary motion vector is the second value if the first level-value of the first column is not less than the second level-value of the first column, the Y coordinate of the preliminary motion vector is the first value if the first level-value of the second column is less than the second level-value of the second column and the most significant bit of the Y coordinate of the preliminary motion vector is the second value if the first level-value of the second column is not less than the second level-value of the second column.

20 Claim 15 (Currently Amended): The device of claim ~~[[13]]~~ 10 wherein the final motion vector comprises a plurality of bits representing an X coordinate within the search window and a plurality of bits representing a Y coordinate within the search window, the candidate results being used to generate the most significant bit of the X coordinate of the final motion vector when indicated by the predetermined set of formulas and the candidate results being used to generate the most significant bit of the Y coordinate of the final motion vector when indicated by the predetermined set of formulas.

30 Claim 16 (Currently Amended): A computer readable media storing therein

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computer-executable program codes used for motion estimation in video compression, the computer readable media comprising:

- 5 computer code that determines a plurality of search locations within a single resolutioned search window, the search locations selected according to a predetermined orthogonal table generated using the statistical model
 $x = \mu + A + B + C + D + A \times B + A \times C + B \times C + \epsilon$ where ϵ is an error factor, and μ is an average of $A, B, C, D, AB, AC,$ and BC , the orthogonal table having columns $A, B, C,$ and D ;
- 10 computer code that compares a reference block with each search location and generates a match-value for each search location indicating how closely each search location matches the reference block;
- computer code that generates a plurality level-values based on a first dispositional relationship of the search locations and the relative magnitudes of the match-values;
- 15 computer code that generates a preliminary motion vector based on the level-values;
- computer code that generates candidate results based on a second dispositional relationship of the search locations and the relative magnitudes of the match-values; and
- 20 computer code that generates a final motion vector by altering the preliminary motion vector according to the candidate results as indicated by a predetermined set of formulas.

Claim 17 (Previously Presented): The computer readable media of claim 16 wherein at least one of the level-values equals the sum of the match-values of a plurality of
25 predetermined search locations.

Claim 18 (Previously Presented): The method of claim 1 wherein at least one of the level-values equals the sum of the match-values of a plurality of predetermined search locations.

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Claim 19 (Previously Presented): The device of claim 10 wherein at least one of the level-values equals the sum of the match-values of predetermined search locations.

5 Claim 20 (Previously Presented): The device of claim 19 wherein the predetermined search locations are all of the plurality of search locations having the same most significant bit of an X coordinate and/or a Y coordinate respectively identifying that search location.